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Ink jet recording appts. e.g. drop-on-demand printer with removable covering member - includes movement prevention device which confines movement when cover is open to remove e.g. jam and releases confining action when closed (Eng)

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The recording appts. has a covering member which can be attached to or removed from a main assembly of the appts. It includes a conveyor (4) for the recording material. A recording device (6) carries out a recording operation while moving along a surface of the recording material.

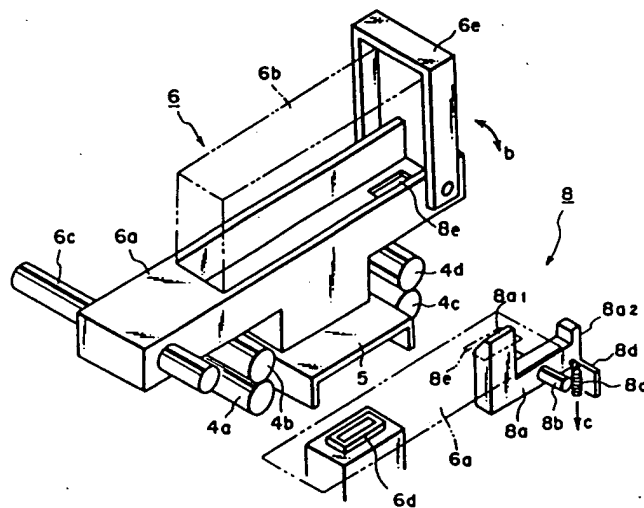
A movement prevention device (8) regulates movement of the recording device, depending on an open or closed state of the covering member. The device confines the movement of the recording device when the covering member is open and releases it when the cover is closed.

ADVANTAGE - Prevents movement of recording device when covering member opened to e.g. remove paper jam. (13pp Dwg.No.1/5)

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(54) **Recording apparatus.**

(57) A recording apparatus provided with a covering member which can be attached to or removed from a main assembly of the apparatus includes conveying device 4 for conveying recording material; a recording device 6 for carrying out a recording operation while moving along a surface of the recording material; and movement prevention device 8 for regulating movement of the recording device 6, depending on an open or closed state of the covering member; wherein the movement prevention device 8 confines the movement of the recording device 6 when the covering member is open, and releases the recording device 6 from the confining action of the movement prevention device 8 when the covering member is closed.

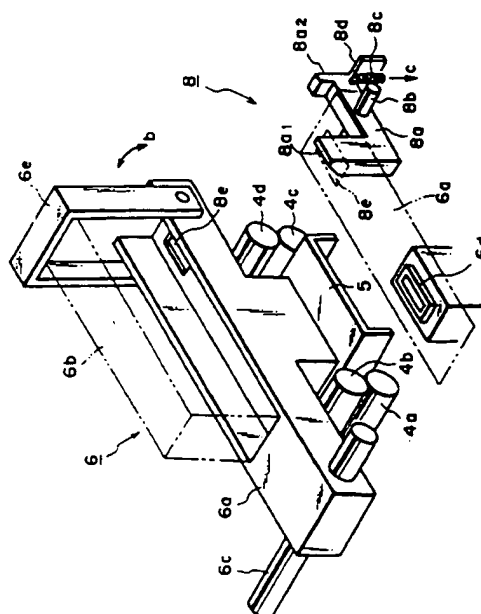


FIG. 1

The present invention relates to a recording apparatus usable to make a recording on recording medium, in particular to a recording apparatus in which the movement of the recording means is prevented when the covering member is opened.

In the past, in the case of a serial recording type of recording apparatus, a single line of recording was carried out through scanning by the carriage, and then, a conveying or feeding mechanism was driven to move the recording paper by a necessary pitch for the next line and thereafter the recording operation is effected for the line.

This type of recording apparatus is configured in such a manner that its carriage is parked at a predetermined location, in other words, a so-called home position, after the printing is finished. The above mentioned home position is set up beyond the range of the conveying mechanism, so that the carriage does not interfere with the conveying mechanism when a jam (paper jam) occurs and the conveying system is opened up to take care of the jam.

However, it is liable in the case of the above mentioned prior example, that the carriage is moved from its location as a user inadvertently touches the carriage while taking care of the jam, whereby the interference between the carriage and the conveying mechanism results in apparatus damages when the conveying system is opened up.

Also, generally speaking, the head section of those using an ink jet printing type recording means is capped to prevent ink from drying when the recording head is parked at the above mentioned home position, but there is such problems that it becomes impossible to cap the head section when the carriage is inadvertently moved as is explained above, or that the ink solidifies to prevent the normal recording if the head is left uncapped.

Accordingly, it is a principal object of the present invention to provide a recording apparatus in which the recording means is prevented from moving when the covering member is opened while a paper jam and the like are taken care of, and in addition, the interference between the recording means and the conveying means is prevented when the conveying means is opened up.

According to an aspect of the present invention, there is provided a recording apparatus provided with: a covering member, which can be attached to or removed from the apparatus main assembly, comprises a conveying means for conveying recording medium; a recording means for carrying out a recording operation while moving along the surface of said recording medium; and a movement prevention means for regulating the movement of said printing means, depending on the open or closed state of said covering member, wherein said movement prevention means regulates the movement of said recording means when said covering member is open, and releases said re-

cording means from the regulation by said movement prevention means when said covering member is closed.

As for the other means, the above recording means further comprises a releasing means for releasing said conveying means, and a release prevention means; wherein said release prevention means allows said releasing means to be operable only when said recording means is at a predetermined location, and regulates the operation of said release means when said recording means is not at the predetermined location.

In the above mentioned means, since the movement prevention means regulates the movement of the recording means when the covering member is opened, the recording means can be prevented from being inadvertently moved while a paper jam and such are taken care of, and since the above mentioned movement prevention means is activated or deactivated depending on the open or closed state of the above mentioned covering member, the above mentioned recording means can be reliably prevented from moving.

Further, since the conveying means is prevented by the release prevention means from being opened up unless the recording means is at the predetermined location, the apparatus damages, which may be caused by carelessness while the above mentioned paper jam is taken care of, can be prevented.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic diagram showing the configuration of the movement prevention means of the recording means in accordance with an preferred embodiment of the present invention.

Figure 2 is a schematic sectional diagram showing the longitudinal cross section of the entire recording apparatus.

Figure 3 is a schematic diagram showing the relation between the movement prevention means and the covering member.

Figure 4 is a schematic diagram showing the configurations of the conveying means and the release prevention means.

Figure 5 is a schematic diagram showing the released state of the conveying means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First embodiment

A recording apparatus in accordance with an embodiment of the present invention, in which the above mentioned means is applied to the ink jet recording system, is explained referring to Figure 1 to Figure 5. Figure 1 is an explanatory view showing the configuration of the movement prevention means for regulating the movement of the recording means in Figure 1. Figure 2 is a schematic sectional view of the overall configuration of the recording apparatus. Figure 3 is an explanatory view showing the configuration of the sheet conveying means, Figure 4 is an explanatory view showing the sheet conveying means, and Figure 5 is an explanatory view of the sheet conveying means in the open state.

This recording apparatus is configured as is shown in Figure 2, wherein recording sheet 2 stacked in a cassette 1 is fed piece by piece by a pickup roller 3 and conveyed by sheet conveying means 4; recording means 6 is driven to make a recording on recording sheet 2 supported from behind by platen 5; and after the recording, the recording sheet 2 is discharged into discharge tray 7.

In this structure, the movement of the above mentioned recording head 6 is regulated by a movement prevention means 8 in Figure 1 when the recording head 6 is at the home position. Further, a releasing means 9 in Figure 4 allows the above mentioned conveying means 4 to be opened up in order to take care of the paper jam and such, but release prevention means 10 allows the opening only when the recording means 6 is at the home position.

Next, a practical explanation is given to the structure of each of the above mentioned means. Sheet conveying means

Sheet conveying means 4 comprises, as is shown in Figure 2 and Figure 4, a conveying roller 4a and a pinch roller 4b for conveying the recording sheet 2 to the recording region, and a discharge roller 4c and a pinch roller 4d for discharging the recorded recording sheet 2 into a discharge tray 7. The above mentioned pinch rollers 4b and 4d are rotatably attached to arms 4f1 and 4f2 which are axially supported by pressure generating shafts 4e1 and 4e2. On the above mentioned pressure generating shafts 4e1 and 4e2, upper guides 4g1 and 4g2 are affixed, which guide the upper surface of the recording sheet 2, and these guides 4g1 and 4g2 are axially supported by shaft 4h. Between the above mentioned upper guides 4g1 and 4g2 and arms 4f1 and 4f2, tension springs 4i1 and 4i2 are stretched.

Further, rotatable hooks 4j1 and 4j2 are provided, and as these hooks 4j1 and 4j2 become engaged with the above mentioned pressure generating shafts 4e1

and 4e2, pinch rollers 4b and 4d come in contact with the conveying roller 4a and the discharge roller 4c, respectively, generating pressure at their points of contact.

The above mentioned conveying roller 4a and discharge roller 4c are rotated by an unshown conveyor motor connected to them, and the recording sheet 2 is conveyed in the direction of an arrow mark (a) in Figure 2 by the coordinated operation between these rollers and the pinch rollers 4b and 4d which are also induced to rotate by the rotation of the former.

Moreover, the driving force is transmitted in such a manner that the peripheral velocity of the above mentioned discharge roller 4c is several percentage points higher than that of the conveying roller 4a, to give a proper tension to the recording sheet 2 while being conveyed.

The recording means 6 records an ink image on the recording sheet 2 conveyed by the conveying means 4. In this apparatus, a serial type ink jet recording system is adopted, in which an ink jet head 6b is mounted on a carriage 6a.

The carriage 6a is slidably attached to a slide rail 6c shown in Figure 1, and is made to reciprocate in the width direction of the recording paper 2, following the slide rail 6c, by an unshown carriage motor and is driving force transmission mechanism.

At the home position of this carriage 6a, a capping means 6d is provided as is shown in Figure 1, so that, when the recording head 6b is parked at the home position, this capping means 6d covers the ink ejecting surface of the recording head 6b, preventing the ink from drying, and also protecting the head.

Moreover, the home position of the carriage 6a is set up beyond the region to where the recording sheet 2 is conveyed.

The recording head 6b ejects the ink onto the recording sheet 2 conveyed by the conveying means 4; the recording head 6b is mounted on the above mentioned carriage 6a, and ejects the ink, selectively and synchronously with the movement of the carriage 6a, to record the ink image on the recording sheet 2, corresponding to recording signals.

This recording head 6b is provided with fine openings (orifices) to eject liquid, a liquid passage, an energy application section provided at a given location of this liquid passage, and an energy generating means for generating the droplet forming energy to be applied to the liquid in this energy application section. As the recording system using an energy generating means for generating such energy, there are recording system using an energy generating means in which an electro-mechanical transducer such as a piezoelectric element is used; a recording method using an energy generating means in which an electromagnetic wave, such as a laser, is irradiated to generate heat, which is applied to eject droplets; a recording method using an energy generating means in

which an electrothermal transducer, such as a heating element containing a heating resistor, heats the liquid to eject the liquid; and the like. Along them, the recording head used in the ink jet recording system, in which the liquid is ejected by thermal energy, can produce a high resolution image since the liquid ejection opening (orifice) for ejecting the recording liquid can be packaged in high density. Along them, the recording head using the electrothermal transducer as the energy generating means can take full advantage of the recent technological development in the field of semiconductors, and the improved reliability in the fields of IC technology and micro-processing technology, whereby its sized can be easily reduced; high density packaging can be simplified; and also, the manufacturing costs become low.

Moreover, the above mentioned recording head 6b unitized with an ink tank is detachably mounted on carriage 6a, and is replaced as needed. Therefore, a U-shaped latching level 6e is attached to carriage 6a as is shown in Figure 1, so that it can rotate in the arrow direction. In other words, when the recording head 6b is mounted on carriage 6a, the latching lever 6e is rotated to the position as shown in Figure 1 to latch the recording head 6b down to the carriage 6a, and when it is removed, the latching lever 6e is pushed down in the arrow (b) direction in Figure 1 to release it.

It is liable that the carriage 6a may be moved away from its home position, depending on the way the force is applied to rotate the above mentioned latching lever 6e. Therefore, in this preferred embodiments, the movement prevention means 8 is provided to prevent the recording head 6b from being moved when it is replaced.

Movement prevention means

Next, the structure of the movement prevention means 8 is explained. In this structure, a U-shaped movement prevention means 8a is provided at the home position of the carriage 6a, in such a manner that it can rotate around shaft 8b. This movement prevention member 8a is urged in the arrow (c) direction in Figure 1 by a tension spring 8c, whereby its lower end remains in contact with a stopper 8d. Also, a tapered section 8a1 is formed at one end of the above mentioned movement prevention member 8a, and at the predetermined location of the bottom surface, there is an engagement hole 8e drilled to be engaged with the tapered section 8a1.

Further, in this structure, the operation of the above mentioned movement prevention member 8a is interlocked with the opening or closing of the covering member 12. In other words, according to the structure of this recording apparatus, covering member 12 can be attached to or removed from the apparatus main assembly 11 as is shown in Figure 3, and projection

8f is provided on the inner surface of the covering member 12. This projection 8f presses the end section 8a2 of the movement prevention member 8a when the covering member 12 is closed, and the above mentioned pressure is released when the covering member 12 is removed.

Therefore, when the covering member 12 is in the closed state as is outlined by the two-dot chain line in Figure 3, the projection 8f presses the above mentioned end section 8a2, rotating thereby the movement prevention member 8a around the shaft 8b in the arrow (d) direction by this pressure, and as a result, the tapered section 8a1 and engagement hole 8e remains disengaged, enabling thereby the carriage 6a to slide along the slid rail 6c to carry out the recording operation without interference.

On the other hand, when the covering member 12 is removed for an operation such as replacing the recording head, the above mentioned projection 8f ceases to press the end section 8a2 of the movement prevention member 8a, allowing thereby the movement prevention member 8a to rotate to come in contact with the stopper 8d due to the tension of the spring 8c. At this time, if the carriage 6a is at its home position (position outlined by the two-dot chain line), the tip of the tapered section 8a1 becomes engaged, as is outlined by the solid line in Figure 3, to the engagement hole 8e drilled in the carriage 6a, and remains engaged there. Therefore, the movement of the carriage 6a along the slide rail 6c is regulated, whereby an occurrence is prevented such that the carriage 6a is inadvertently moved during the head replacing operation and the like.

Further, if the carriage 6a is moved toward its home position when the covering member 12 is in the open state due to an unexpected accident such as a power failure and the carriage 6a remains suspended at a location other than its home position, the under side of the carriage 6a slides along the surface of tapered section 8a1, whereby the movement prevention member 8a is pressed down, and as it is further moved, the tapered section 8a1 engages into the engagement hole 8e due to the urging force of spring 8c, thereby regulating the movement of the carriage 6a from the home position.

As has been described above, when the covering member 12 of this recording apparatus is opened, the movement prevention member 8a coordinately responds to regulate the movement of the carriage 6a at the home position, and when the covering member 12 is closed, it relates the carriage 6a from the movement regulation. Therefore, inadvertent movement of the carriage 6a when the recording head 6b is replaced or the paper jam and such are taken care of is eliminated.

Releasing means

Next, the releasing means 9 is a mechanism for making it easier to take care of the paper jam when the recording sheet 2 is jammed by the sheet conveying means 4, or a like incident occurs, and it allows the pinch roller 4b to be released away from the conveying roller 4a, and the pinch roller 4d from the discharge roller 4c, so that there are sufficient gaps between the respective rollers.

Its structure is as shown in Figure 4, that is, hooks 4j1 and 4j2 are solidly affixed to shafts 9a1 and 9a2, and the hooks 4j1 and 4j2 are integrally formed with gear sections 9b1 and 9b2 which rotate around the above mentioned shafts 9a1 and 9a2. One of the above mentioned gear sections, the gear section 9b1, is indirectly meshed with the rack member 9d through the cam gear 9c, and the other, the gear section 9b2, is directly meshed with rack member 9d.

An operating lever 9e is attached to the above mentioned shaft 9a2. Therefore, when the operating lever 9e is rotated in the arrow (e) direction in Figure 4, the hook 4j2 rotates in the arrow (e) direction, becoming disengaged from the pressure generating shaft 4e2; simultaneously, the rack member 9d slides in the arrow (f) direction; the hook 4j1 rotates in the arrow (g) direction, getting disengaged from the pressure generating shaft 4e1; and as a result, the pressure between the conveying roller 4a and pinch roller 4b, and the discharge roller 4c and the pinch roller 4d, are released. At this time, release prevention member 10a, which is explained later, is poised as outlined by the broken line in Figure 4.

At this time, arms 4f1 and 4f2 are held by the tension from springs 4i1 and 4i2 while the sections of these arms 4f1 and 4f2 remain in contact with shaft 4h. As the operating lever 9e is further rotated in the arrow (e) direction, the arm 9c1 affixed to the cam gear 9c rotates a cam 9f affixed solidly to shaft 4h, and as a result, the pinch roller 4b is lifted upward together with the upper guide 4g1, as is shown in Figure 5.

Therefore, the sheet conveying means 4 is widely opened up, whereby the recording sheet 2 jammed in the conveying passage can be easily removed.

Release prevention means

In such a situation as is shown in Figure 5 in which the sheet conveying means 4 is wide open as was described above, the upper guide 4g1 and the pinch roller 4b are invading into the scanning range of the carriage 6. Reversely speaking, this means that if the operating lever 9e is operated when the carriage 6a remains suspended at a location other than its home position, the upper guide 4g1 and the pinch roller 4b interfere with the carriage 6a. Therefore, in this preferred embodiment, the release prevention means 10

is provided, so that the sheet conveying means 4 is allowed to be opened up only when the carriage 6a is at the home position, and if the carriage 6a is at other locations, the conveying means 4 is prevented from being opened up.

As for the configuration of the release prevention means 10, an L-shaped release prevention member 10a is provided, which can pivot about shaft 10b. When this release prevention member 10a takes the position outlined by the solid line in Figure, the end section of the rack member 9d remains in contact with the release-prevention member 10a. Also, one end of connecting rod 10c is pivotally attached to the above mentioned release prevention member, and on the other end of this connecting rod 10c, an L-shaped engaging member 10d is mounted. This engaging member 10d engages with the lower end of the carriage 6a and slides the connecting rod 10c in the arrow (h) direction as the carriage 6a is moved toward its home position.

Therefore, when the carriage 6a is at a location other than the home position, the release prevention member 10a takes the position outlined by the solid line, preventing the rack member 9d from sliding in the arrow (f) direction. As a result, the operating lever 9e cannot be operated in the arrow (e) direction, preventing the sheet conveying means 4 from being opened up.

On the other hand, when the sheet conveying means 4 is opened up to take care of a paper jam or the like, the movement of carriage 6a toward its home position makes the connecting rod 10c slide in the arrow (h) direction; the release prevention means 10a rotates to take the position outlined by the broken line in Figure 4, allowing the rack member 9d to slide; and therefore, the operating lever 9e can be operated to open up the sheet conveying means 4. At this moment, the movement of the carriage 6a is prevented by the movement prevention means 8.

As was described above, in this preferred embodiment, the sheet conveying means 4 can be opened up only when the carriage 6a is at its home position, and when the carriage 6a is at other locations, the sheet conveying means 4 is prevented by the release prevention means 10 from being opened up, and therefore, damages to carriage 6a, the recording head 6b, and the like, can be prevented.

Another embodiments

In the preferred embodiment described above, the ink jet recording method is used as the recording means, but a configuration is more preferable such that electric current is flowed through the electrothermal transducer corresponding to the recording signal, and the bubble grown by film boiling caused by the heat from the above mentioned electrothermal transducer is used to eject the ink for recording.

Preferably, the recording head and the apparatus is of the type disclosed in U.S. Patent Nos. 4,723,129 and 4,740,796 which disclose a typical structure and the operational principle. The structure and the principle are applicable to a so-called continuous type recording system.

Particularly, however, the bubble jet structure and principle are suitable for the on-demand type because the principle is, in brief, such that at least one driving signal is applied to an electrothermal transducer disposed on a liquid retaining sheet or passage, the driving signal being enough to provide such a quick temperature rise beyond a departure from nuclear boiling point, by which the thermal energy is provided to produce the film boiling at the heating portion of the recording head, upon which a bubble can be formed in response to the driving signal. By the development and contraction of the bubble, the liquid is ejected through an ejection outlet to produce at least one droplet. The driving signal is preferably in the form of a pulse, because the development and contraction of the bubble can occur instantaneously, and therefore, the liquid is ejected with quick response.

The driving signal in the form of a pulse is preferably such as disclosed in U.S. Patents Nos. 4,463,359 and 4,345,262. In addition, the temperature increasing rate of the heating surface is preferably as disclosed in U.S. Patent No. 4,313,124.

The structure of the recording head may comprise the combination of the ejection outlet, the liquid passage and the electrothermal transducer as disclosed in the above mentioned U.S. Patent (linear liquid passage or rectangular liquid passage), or may be the one disclosed in U.S. Patent Nos. 4,558,333 and 4,459,600 wherein the heating portion is disposed at a bent portion. The present invention is also applicable to the structure disclosed in Japanese Laid-Open Patent Application No. 123670/1984 wherein a common slit is used as the ejection outlets for plural electrothermal transducers, and also to the structure disclosed in Japanese Laid-Open Patent Application No. 138461/1984 wherein an opening for absorbing pressure wave of the thermal energy is formed corresponding to the ejection portion. In other words, according to the preferred embodiment of the present invention, the printing process can be carried out, surely and efficiently, whatever form the recording head takes.

Further, the present invention is effectively applicable to a recording head in the form of an exchangeable chip which is electrically connected with and supplied with ink from the main assembly of the recording apparatus when mounted on the main assembly, or in the form of a cartridge type recording head integrally mounted.

The provision of the recovery means or the auxiliary means for the preliminary operation is preferable, because it can further stabilize the advanta-

geous effects of the present invention. As for examples of such means, there are capping means for capping the recording head, cleaning means for cleaning the recording head, pressure applying means or sucking means for applying pressure to or sucking the liquid in the passage, preliminary heating means using the ejecting electrothermal transducers or by a combination of the ejecting thermal transducer and additional heating means, and means for effecting preliminary ejection of the liquid not for the recording operation. They can stabilize the recording operation.

As regards the recording mode of the recording apparatus, it is not limited to record only by a main color such as black. The present invention is effectively applicable to a recording apparatus having an integral recording head or a combination of plural recording heads for the recording operation at least one of the multi-color modes using different colors and a full-color mode using color mixture.

Additionally, in the foregoing embodiment, the ink has been described as liquid. However, it may be an ink material which is solid at the room temperature or an ink material which is softened at the room temperature. Since in the ink jet recording system, the ink is usually controlled within the temperature not lower than 30 °C and not higher than 70 °C to stabilize the viscosity of the ink to stabilize the ejection, the ink may be such that it is liquid when the recording signal is applied in use. The present invention is applicable to the ink which is liquefied by application of the thermal energy thereto. In an example of such a type, the thermal energy is positively consumed for the phase change from the solid state to the liquid state so as to suppress the temperature rise by the thermal energy. In another example, the ink is solidified when left as it is, for the purpose of preventing the evaporation. In these examples, the ink is liquefied by the application of the thermal energy thereto in response to the recording signal, and the liquefied ink is ejected. In one example, the ink already starts to be solidified when reaching the recording medium. Such an ink material may be retained as liquid or solid ink in holes or recesses formed in a porous sheet as disclosed in Japanese Laid-Open Patent Application Nos. 56847/1989 and 71260/1985, in this case, the sheet is faced to the electrothermal transducers. The most effective actuation of the above mentioned ink is to cause film boiling thereof.

Further, as for the form of the above mentioned ink jet type recording apparatus, the present invention is applicable to the printing apparatus which takes the form of a copying machine combined with a reader and the like, and a facsimile machine having transmission/reception function, besides those used as an image output terminal of the information processing machine such as computer.

Incidentally, as the recording means, an example using the ink jet type recording system was explained

above, but the present invention does not need to be limited to the ink jet type recording system, and is also applicable to other recording system such as thermal transfer recording system and thermal recording system, except the impact recording system such as wire dot recording system.

In the present invention, since the movement prevention means is provided, as was explained above, to regulate the movement of the recording means, depending on the open or closed state of the covering member, it is possible to prevent the recording means from being inadvertently moved when the covering member is opened to take care of the paper jam and the like.

Also, if the release means is provided for releasing the sheet conveying means from the recording medium, and also, the release prevention means is provided for locking the above mentioned release means when the recording means is not at the predetermined location, it becomes possible to prevent more reliably the interference between the recording means and the conveying means, whereby the apparatus damages and the likes can be prevented.

While the invention has been described with reference to the structures disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purposes of the improvements or the scope of the following claims.

Claims

1. A recording apparatus provided with a covering member which can be attached to or removed from a main assembly of the apparatus, comprising:

conveying means for conveying recording material;

recording means for carrying out a recording operation while moving along a surface of the recording material; and

movement prevention means for regulating movement of said recording means, depending on an open or closed state of said covering member;

wherein said movement prevention means confines the movement of said recording means when said covering member is open, and releases said recording means from the confining action of said movement prevention means when said covering member is closed.

2. A recording apparatus in accordance with Claim 1, further comprising releasing means for releasing said conveying means, and a release prevention means, wherein said release prevention means allows said releasing means to be oper-

able when said recording means is at a predetermined location, and confines the operation of said release means when said recording means is not at the predetermined location.

3. A recording apparatus in accordance with Claim 1, wherein said recording means comprises an ink jet recording apparatus which carries out the recording operation by ejecting ink corresponding to signals.

4. A recording apparatus in accordance with Claim 3, wherein said recording means comprises an ink jet recording apparatus in which electric current is flown through an electrothermal transducer, in response to a signal, and heat energy from said electrothermal transducer is used to eject ink for recording.

5. A recording apparatus in accordance with Claim 4, wherein said recording means comprises an ink jet recording apparatus in which electric current is flown through an electrothermal transducer, in response to a signal, and recording ink is ejected by the growth of a bubble generated by film boiling caused by the heat energy from said electrothermal transducer.

6. A printer including a print head (6); means for moving said print head during a print operation; characterised by means (8) for preventing movement of said head when a head cover is open.

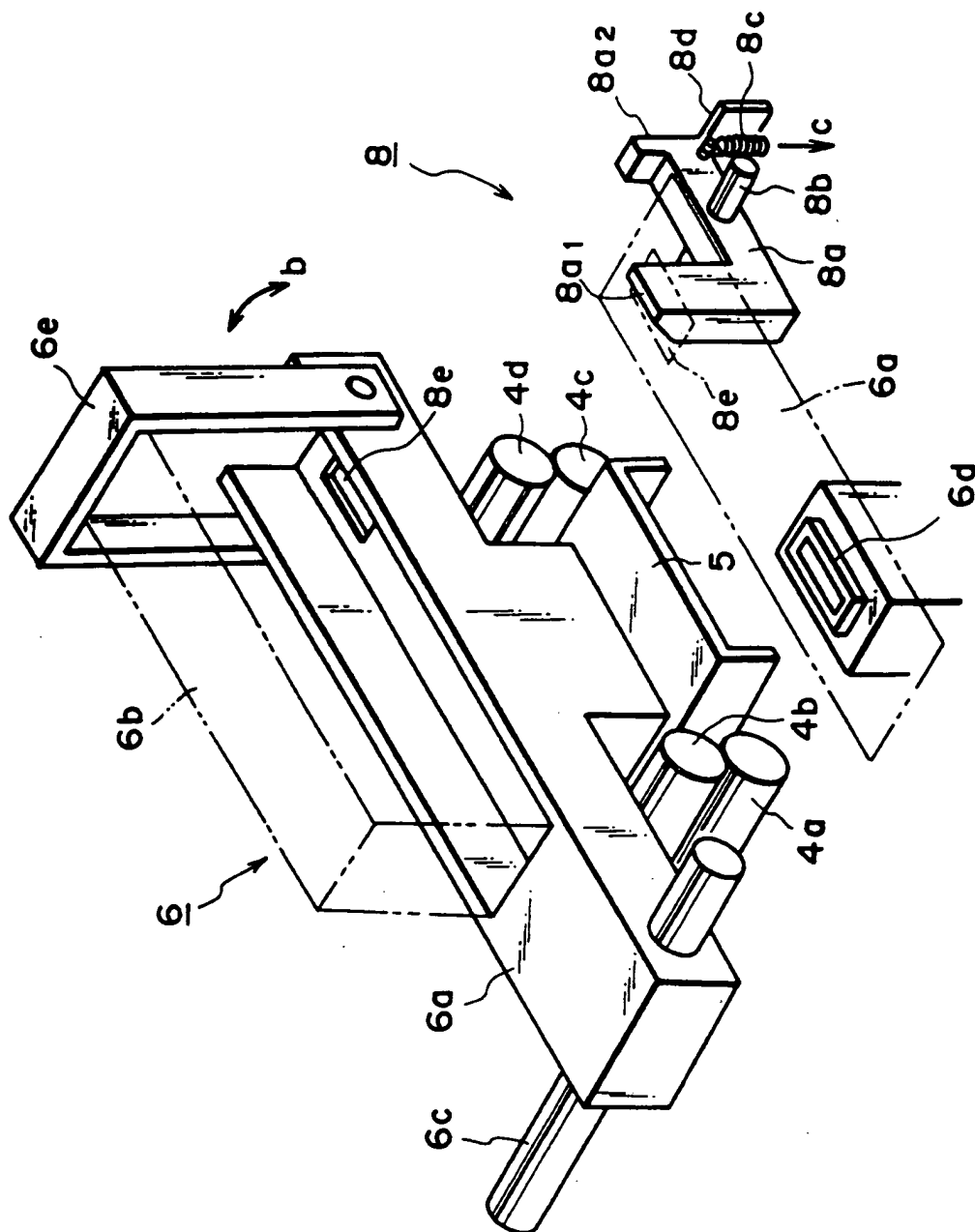
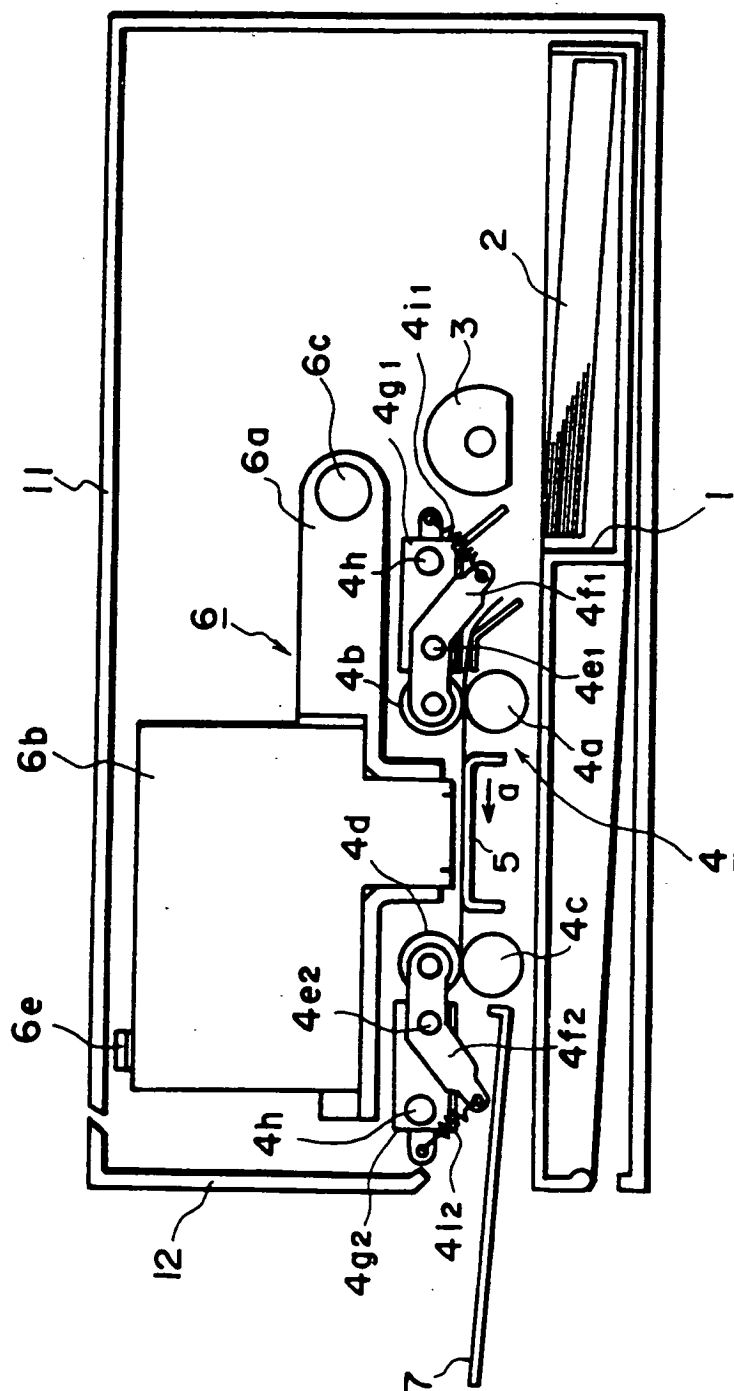


FIG. 1



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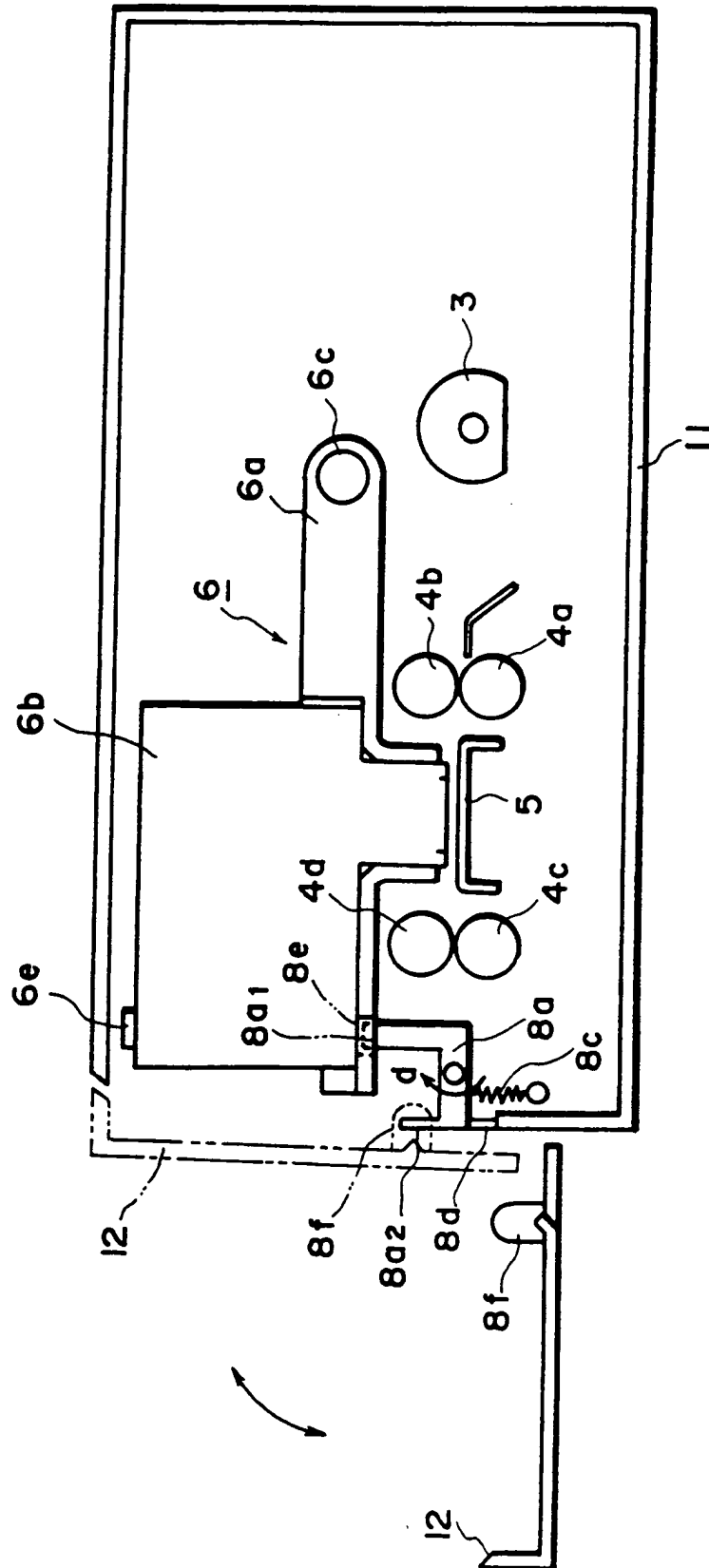


FIG. 3

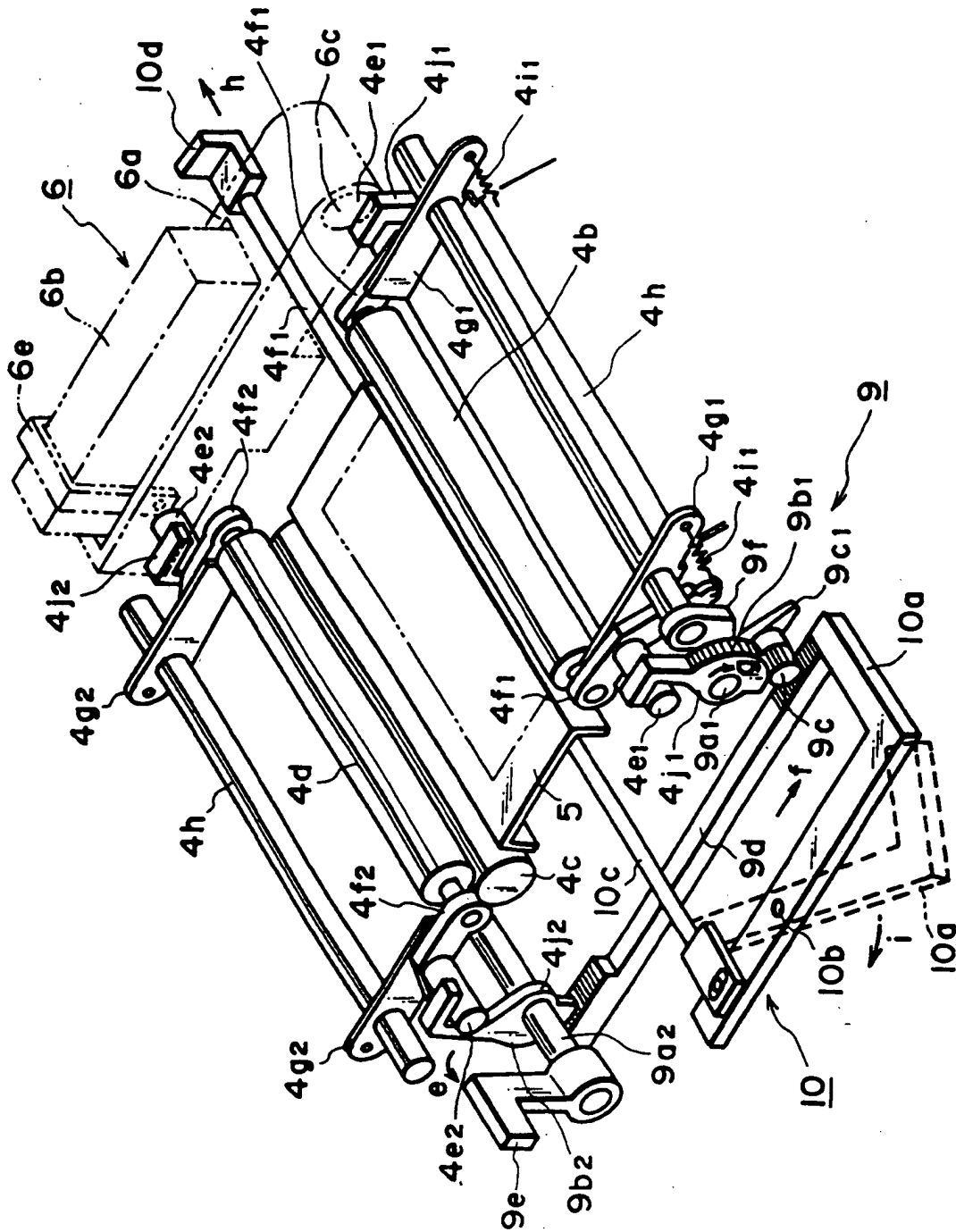


FIG. 4

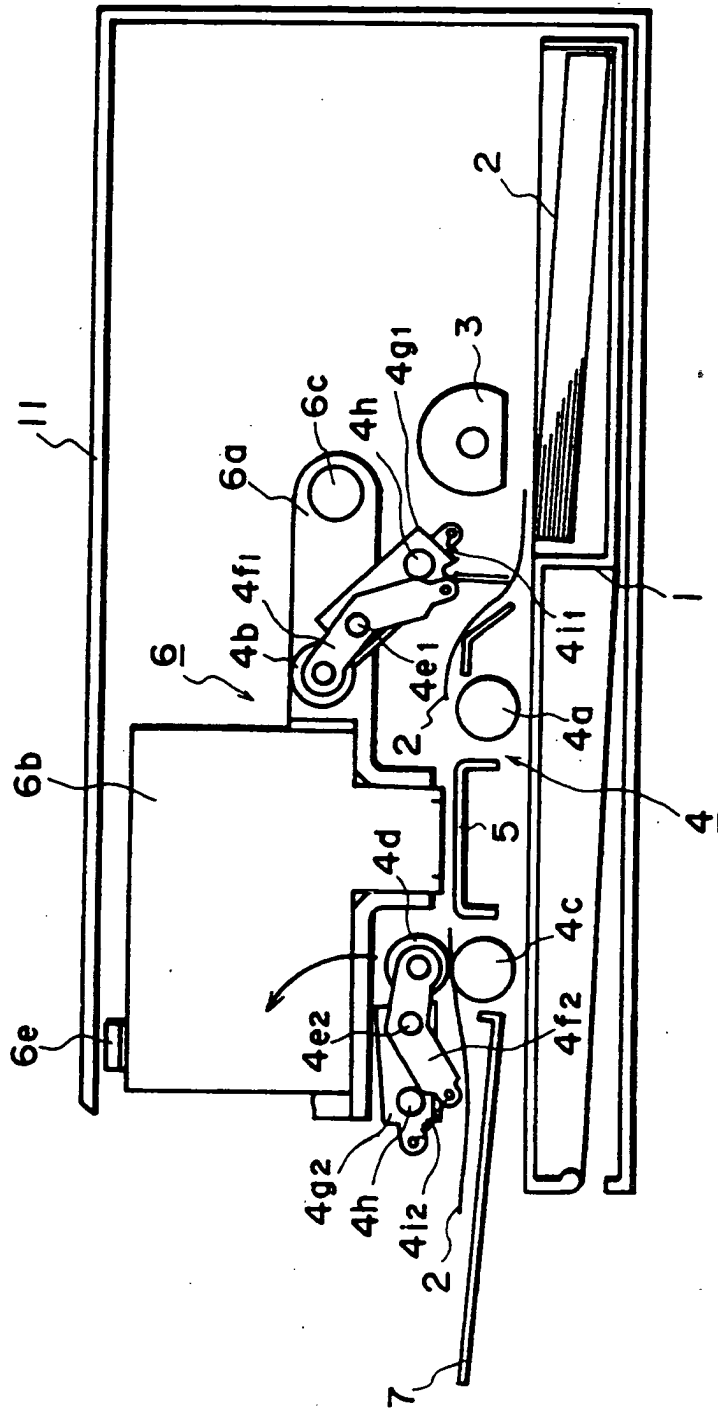


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 5875

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.5)
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 10 (M-446)(2067) 16 January 1986 & JP-A-60 172 575 (KIYANON DENSHI K.K.) 6 September 1985 * abstract *	1,6	841J29/58
Y	---	3-5	
Y	EP-A-0 379 151 (CANON K.K.) * column 1, line 15 - column 4, line 5; claims 1-3 *	3-5	
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 10 (M-446)(2067) 16 January 1986 & JP-A-60 172 576 (KIYANON DENSHI K.K.) 6 September 1985 * abstract *	1,6	
X	PATENT ABSTRACTS OF JAPAN vol. 11, no. 146 (M-587)(2593) 13 May 1987 & JP-A-61 279 573 (RICOH CO LTD) 10 December 1986 * abstract *	1,6	
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 14 (M-659)(2861) 16 January 1988 & JP-A-62 174 167 (TOSHIBA CORP) 30 July 1987 * abstract *	2	TECHNICAL FIELDS SEARCHED (Int. CL.5)
A	NL-A-283 792 (MAX GRUNDIG) * page 2, line 12 - line 27 *	1-6	B41J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10 AUGUST 1992	Examiner JOOSTING T.E.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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